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JPRS L/9097

19 May 1980

# Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

(FOUO 6/80)



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NUCLEAR DEVELOPMENT AND PROLIFERATION  
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JAPAN

LESS ENRICHED URANIUM TO LESSEN DANGER OF PROLIFERATION

Tokyo ASAHI SHIMBUN in Japanese 30 Mar 80 p 1

[Text] Prospect Gained for Operation of Research Reactor With the Use of Moderately or Slightly Enriched Uranium; Switchover Will Be Completed Around 1984, To Lessen Danger of Nuclear Proliferation

A prospect has been gained for the continued operation of Japan's main research reactors (using 93 percent-enriched uranium), which at one time were threatened with the danger of closure due to the stern policy taken by the United States against the potential danger of conversion to production of nuclear weapons, with the lessening of this danger. According to the plan revealed by Keiji Kanda, assistant professor at Kyoto University's Atomic Reactor Laboratory, on the 29th, the last day of the meeting of the Japan Atomic Energy Science Academy held at Nagoya University, the technological possibility of keeping such reactors in operation, without any decline in their efficiency, with the use of moderately (45 percent)- or slightly (20 percent)-enriched uranium, has been ascertained. The new technological method will be applied to five reactors, including the Japan Atomic Energy Research Institute's material testing reactor (JMTR). The introduction of this method will not only give impetus to the development of indigenous atomic energy technology, but also increases greatly the safety of atomic reactors from such untoward incidents as nuclear-jacking.

Uranium-235, which is in use as nuclear fuel for the light-water reactors for the generation of electric power and which causes nuclear fission in a chain reaction, is enriched only slightly, or about 3 percent. On the other hand, the research reactors, which must be small in scale and have a high efficiency, use uranium enriched as highly as 90 to 93 percent. This metallic, highly enriched uranium is an extremely dangerous nuclear material, because only about 20 kilograms of this kind of enriched uranium involve the possibility of explosive occurrence of chain reactions.

The United States, which has a monopoly of the enriched uranium market in the free world, clarified, by President Carter's statement, its decision

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to impose rigid restrictions against the use of highly enriched uranium in 1977, saying that it must be feared that the use of highly enriched uranium may lead to nuclear proliferation. The U.S. State Department then established guidelines, whereby the United States is to export, in principle, only the slightly enriched uranium, or uranium enriched 20 percent or less, to other nations.

Japan and other nations, which until that time had maintained highly enriched uranium research reactors in operation, were asked to reduce the rate of enrichment as early as possible. This became an important theme at the meeting of the International Nuclear Fuel Cycle Evaluation (INFCE). Also consultations were held among nations on this problem at such places as the International Atomic Energy Agency (IAEA).

In Japan, conferences were held repeatedly among the Science and Technology Agency, the Foreign Ministry, the Education Ministry, the Japan Atomic Energy Research Institute and Kyoto University. As a result, a tentative agreement was reached on a plan for the reduction of the rate of enrichment, which reduction is needed for five reactors.

According to this plan, which is shown in a separate table, the rate of enrichment is to be reduced to 45 percent for three of the five reactors, and to 20 percent for the remaining two, for the present. It has been decided to carry out the reduction of the rate of enrichment by two stages, because the theoretical calculation of nuclear energy made it clear that it is possible to process uranium with up-to-date technology, and keep the reactor working efficiently, without remodeling its core drastically, when the rate of enrichment is not higher than 45 percent, and that the rate of enrichment can be reduced to 20 percent, when it is possible to remodel the reactor core to some extent. This policy made by Japan will be clarified in the guide-book to be published soon by the IAEA.

The United States, which had decided to permit, in principle, only the use of the uranium enriched 20 percent or less, appreciated the earnest efforts made by Japan, and gave final approval to this idea of reducing the rate of enrichment by two stages. Furthermore, a U.S. Arms Control and Disarmament Agency source promised, toward the end of last year, to continue to supply highly enriched uranium needed by Japanese reactors, as an exceptional step, until less-enriched uranium is made available for these reactors.

Before the reactors are brought into operation with the use of less-enriched uranium, they must undergo tests, including safety tests, to be conducted with the use of test fuel. There are indications that their switchover to less-enriched uranium will become possible around 1984, if all goes smoothly.

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It Is Difficult To Process Fuel at Home

(Commentary)--The 93 percent-enriched uranium, which is imported into Japan, is a metallic uranium ingot, which remains to be processed into fuel. Most rigid measures must be taken to guarantee the safety of this nuclear material. This kind of uranium is processed into an alloy aluminum plate, which is to be used for fuel, by the Atomic Fuel Industry Company (in Osaka Prefecture). In Japan, there are 14 research reactors in all. Five of them, including the high-flux reactor to be built by Kyoto University, must replace highly enriched uranium by that less enriched.

It is said that nuclear weapons, which are to use highly enriched uranium, can be designed more easily than those using plutonium, which recently is attracting attention. It is also said that one or more materials for nuclear weapons can be obtained in a year, even by extracting uranium embers from the used fuel taken from a research reactor at a reprocessing plant, which is far smaller than the reactor for the generation of electric power.

Only if the rate of enrichment is reduced to 45 percent, resistance against nuclear proliferation will be strengthened drastically. The problem is that the reduction of the rate of enrichment will make it necessary to increase the quantity of fuel or the rate of concentration, because it is accompanied by a decrease in the amount of Uranium-235 at the reactor core. For switchover to 45 percent-enriched uranium, up-to-date technology, which can concentrate and press powdered aluminum and uranium together, is necessary. It is difficult for Japanese plants to undertake such a technological process, for economic and other reasons. So there is the strong likelihood that they will ask such foreign countries as West Germany and France to do this processing work on commission.

Engineering study and development will become necessary hereafter. The Atomic Energy Research Institute and Kyoto University have already started joint study with the Argonne National Laboratory of the United States. With consideration for such delicate related problems as safety of fuel, the Atomic Energy Research Institute maintains a cautious attitude, saying that "We shall wait until the results of the test operation of the reactor core will become clear around the fall of 1983" (Director Yoshiharu Okubo of the Nuclear Fuel Control Section of the institute). It is clear, however, that a bright prospect has been gained, as can be seen from the following statement: "It represents an epoch-making advance that the theoretical calculations made in the respective countries have produced similar conclusions" (Assistant Professor Kanda).

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## Plan for Reduction of Enrichment Rates of Fuel for Research Reactors

<u>Title of reactor</u>	<u>Owner</u>	<u>Location</u>	<u>Thermal output (shown in thousand kilowatts)</u>	<u>Criti- cality first reached</u>	<u>Rates of enrichment (%)</u>	
					<u>Exist- ing</u>	<u>Sched- uled</u>
JRR-2	JAERI	Tokai-mura	10	1960	93	45
JRR-4	JAERI	Tokai-mura	3.5	1965	93	20
JMTR	JAERI	Oarai-machi	50	1968	93	45
KUR	Kyoto Univ.	Kumatori-machi	5	1964	93	20
KUFR (high-flux reactor to be built by Kyoto Univ.)	Kyoto Univ.	Kumatori-machi	30	1982 (?)	93	45

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SWEDEN

VATTENFALL'S DIRECTOR NORRBY DISCUSSES POST-REFERENDUM PLANS

Stockholm VECKANS AFFÄRER in Swedish 27 Mar 80 pp 54, 55

[Interview with Jonas Norrby by Åke Landquist]

[Text] Jonas Norrby, 60 years old in August, became director general of Vattenfall [Swedish state power authority] in 1970. He has been head of that agency throughout the almost 10 years' conflict over nuclear power. He has defended nuclear power and he defends it for the future. In the future picture he gives of Vattenfall after the turn of the century nuclear power is still included. "Whether it will be closed down or not I leave unsaid," he says.

As a proponent of nuclear power, Jonas Norrby has stood out as a champion of large-scale technology. It is thus something of a paradox that in his spare time he makes wooden peasant furniture for relatives and friends. He has traced his family in Härjedalen back to the 1700's. This search for his roots led him into a broader historical research on his home district. He often sits and digs in the documents of the military records office and gathers material, e.g., on the Swedes' retreat from Norway in 1719. In that retreat 3,000 men were left behind in the cold on the endless snow-covered mountains of Härjedalen.

Jonas Norrby has a house in Älvkarleby on traditional Vattenfall ground. There, when he has retired, he can follow Vattenfall's research and development of alternative sources of energy such as sun and wind. According to plans he is to retire 31 December 1981. Will he? "I have not made up my mind," says Jonas Norrby.

The whole uproar about the Swedish nuclear power program has cost Vattenfall 2 to 3 billion [kronor]. And that estimate is cautious, says its head, Jonas Norrby. Even after the victory of the "aye" voters there are still knots to be untangled, but if the politicians come to an agreement two units can be loaded within just a few weeks, he reveals.

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[Question] The referendum is over and four nuclear power units are ready for loading. Do you foresee any problems? Is the conditional act still in the picture? Or is the loading question a purely a political and administrative affair?

[Answer] Four reactors are ready, but we have to make a distinction with regard to loading. We have the government's permission according to the conditional act to load Ringhals 3 and Forsmark 1. But we cannot charge them anyway, because of the breathing space act that was passed last year. That law applies until 30 June. It is in the government's power to annul that law. With regard to the other two units, Ringhals 4 and Forsmark 2, we have not got permission to load them under the conditional act. The applications are in, but the government has not considered them. We expect them to be approved, now that the referendum is over.

We can load Forsmark 1 within a few weeks. There can be commercial operation toward the end of the year. The same is true of Ringhals 3. For the other two the delay will be longer. If everything goes as planned, Forsmark 2 will get into operation during 1981 and Ringhals 4 during 1982.

[Question] Do you expect demonstrations in connection with the loading? Will we have demonstrations of the same type as those at Gorleben in the Federal Republic of Germany?

[Answer] I cannot judge that. But I do not believe that the climate in Sweden is like that. Fortunately, we do have an extremely open society. Now that the referendum has been held, I imagine the result will be obeyed.

[Question] The Swedish nuclear power program will produce about 8,000 tons of highly active wastes. Can this be stored safely at a reasonable price? Are you as optimistic as the Soviet scientist who said on a TV program that in 40 years we shall be making soup plates out of the radioactive waste?

[Answer] We do not appraise the question that way. But it should be made clear that we do consider that the waste material contains a number of products that may be very attractive. It contains, for example, a certain proportion of precious metals of the platinum family. Platinum is a scarce raw material. It also contains a lot of rare gases that lose their radioactivity quite rapidly and can be used, for example, in furnaces. Then there is the poisonous substance cesium, an incredibly reliable source of heat which is already in use in arctic areas, for military purposes, to be sure, but in any case. In addition there are radiation products that can be used for sterilizing foodstuffs, instruments at hospitals, and so on.

We have had to submit an absolutely safe method of storage. We do not insist by any means that the method we presented is the one that will be followed in practice. All we contend is that it is safe. We also think it will be possible to make the method cheaper. For the present we cautiously estimate 1 øre per kilowatt hour to handle and store the waste.

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[Question] Vattenfall is counting on a profit for this fiscal year of 1,650 million kronor. It will be a new record year with a return on the productive capital of a good 15 percent. At that rate you are beating practically all the industrial firms in the country. Which installations are the big profitmakers? Are their other golden eggs besides the old water power plants?

[Answer] Well, old water power plants now have very small costs to bear. Those power plants yield big surpluses. But the Ringhals plant also had good proceeds. The early nuclear power does not beat water power, but it is clearly more profitable than oil-based power. The better nuclear power goes, the better our earnings will be. A comparison of the operating costs per kilowatt hour in the Ringhals nuclear power plant with the oil power plant in Stenungsund shows that the difference is enormous: 4.5 öre in Ringhals against 20 öre in Stenungsund.

[Question] In a time of declining standards for workers and civil servants, isn't it a ticklish matter for a commercial department to give the picture of a profit machine that makes billions? Is a reduction in taxes an absurd idea?

[Answer] The surplus we show is not a profit in the sense that you have in corporate reports. To an overwhelming degree it is interest on the capital we have borrowed from the state. We have an interest payment demand on us of about 10 percent. This year we made about 300 million kronor above that, thanks to the fact that it has been a very wet year. That will be balanced against the deficit we have in a dry year.

"The Uncertainty Has Hit Our Employees"

[Question] The nuclear power debate has involved hurling harsh epithets, throwing suspicion on the other side's arguments, etc. You are the head of Sweden's biggest producer of electricity. How did Jonas Norrby as a person feel the uproar about nuclear power? Has it been a strain? Or was it calm in the eye of the storm?

[Answer] It was bothersome in many ways. Waiting can be painful in itself. But the worst has been the effect on the employees. They wanted a long-term planning so that they would know security for the future. That desire has been stronger of late than ever before. All this uncertainty has hit the employees hard, and I think that is painful.

[Question] What energy policy foundations does Vattenfall have today on which to base long-term decisions? Is there anything elsewhere in the world corresponding to the Swedish energy policy fight of the 1970's? What problems has that created?

[Answer] I want to say that today we have no long-term energy policy. But of course we hope that the picture will be clarified now by the state authorities' decisions after the referendum. The problem has hit not only

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our personnel but also our customers, especially the big industries. They have not known how energy prices were going to move or even whether we would have enough electric power to offer. That has been a drag on many firms.

But with the 12-reactor program Sweden is in a very favorable situation with regard to electricity for the 1980's. Swedish industry is sitting pretty.

[Question] Better than many competing countries?

[Answer] At least no worse. The greater part of the program is already built. Inflation cannot affect it, and we can feel relatively sure of the trend of electricity prices during the 1980's.

[Question] What have the effects of the nuclear power debate--accidental shut-down of one nuclear power plant, the breathing-space act, delays, etc. --cost Vattenfall? What is the price tag?

[Answer] At a cautious estimate, 2 to 3 billion [kronor]. The biggest part is due to the fact that the loss in electric power production from nuclear plants had to be made up with oil-based power.

[Question] Vattenfall is now working on alternative energy sources. The solar research is concentrated at Älvekarleby. There is also an experimental wind power installation. Are these experiments that Vattenfall is doing with spontaneous enthusiasm, or are they forced by public opinion?

[Answer] We are commissioned by the state authorities, for example, to erect some peat-burning plants. And we have thrown ourselves into that with great enthusiasm. We are now operating four goal-oriented projects. In Gällivare and Boden they are hot water plants; in Umeå and Östersund they produce both power and heat.

As far as the solar heating project is concerned, we have done that on our own initiative. We believe that in something like reasonable time we shall be able to be able to have self-supporting projects going. But there it is not a matter of power but of heat. The main thing I am thinking of here is heat pumps. We include them in solar energy and are optimistic about their possibilities.

As for wind, we have not felt that the possibilities of success were so great as to justify spending the customers' money on big projects. Besides, the state has decided to get prototypes for wind power plants through other agencies.

[Question] Coal is also an alternative source of energy, even though it is old. Vattenfall is operating the Coal-Health-Environment project, which may be as important for coal as the KBS [Nuclear Fuel Safety Project] was for nuclear power. What do you think, will there be a massive renaissance for coal? Will there be an environmental fight?

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[Answer] I think nuclear power is a better alternative than coal. But I believe it is possible to develop purification methods that make coal-burning tolerable. But certainly there will be a fight over coal, too.

[Question] Will Vattenfall join with the LKAB Mining Company, Sydkraft, EFO [expansion unknown], and others to form a sort of Swedish Coal Corporation? Will you conclude long-term agreements and buy shares in coal mines?

[Answer] That is not clear yet, and the problem should not be magnified. There is nothing so remarkable about buying coal. The problem, apart from organization, may be that the coal the world wants may not be available. Then it may be a strong point that the Swedish efforts are appropriately coordinated.

Söderhamn and Oxelösund Possible Sites for Vattenfall's Coal Power Plants

[Question] But this coordination will have long-term agreements and shares in coal mines as a natural result?

[Answer] That may be something to work toward, but it is too early to talk about that now. But I agree that there should be both.

[Question] Sydkraft already has an application in to build a big coal power plant. What are Vattenfall's plans?

[Answer] We shall not need any coal power plants before 1990 if nuclear power can be used as planned. But it is possible that we may build coal power plants somewhat earlier in order to reduce the use of oil. We could put a coal power plant into operation toward the end of the 1980's. We have a site in Hälsingland, near Söderhamn. Another interesting site is Oxelösund. And then we are also interested in combination power and heating plants based on coal, for example in the Stockholm area.

[Question] How will Vattenfall look after the year 2000? Give us a picture of the future!

[Answer] One thing is clear--our whole water power apparatus is in good trim and generating power. Nuclear power is also in operation. Whether it will be closed down I leave unsaid. For my part I believe that confidence in nuclear power will have grown strong by that time, especially in the world around us.

For the rest, there should be several coal-based power plants and combination power and heating plants, plus a number of power and heating plants with peat as fuel, perhaps in combination with wood chips. I believe that unfortunately wind power will not be able to compete. But the possibility should not be overlooked. I believe oil will continue to play a big part. The heavy oils that are not used today are of special interest. Together with state enterprises we are investigating a project aimed at making use

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of the high-sulfur residual oils from refineries by a highly effective desulfurization process. They may be important power plant fuels in the future and may be followed by asphalt oils, chiefly from Venezuela.

One thing that may be of great significance for Swedish energy supplies around the turn of the century, but not as a power plant fuel, is natural gas. It will be exciting to see whether the agreement with Denmark can have the consequence of giving us an additional supply of energy from the Norwegian gas fields in the North Sea.

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UNITED KINGDOM

GOVERNMENT APPROVES PLANS FOR NEW NUCLEAR REACTORS

LD170815 London THE GUARDIAN in English 15 Apr 80 pp 1, 28

[Report by Jane McLoughlin: "High Cost Nuclear Go-ahead"]

[Text] The government yesterday announced the go-ahead for two advanced gas-cooled [agr] nuclear reactors to be built at Heysham and Torness at a total cost of 2,400 million pounds.

Mr David Howell's announcement to MPs yesterday that the Central Electricity Generating Board can build the AGRs ends months of debate between members of Cabinet and within the nuclear industry itself. The conflict has significantly held up the programme to increase the amount of nuclear-generated power.

Mr Howell, the energy secretary, told the Commons yesterday that the consumer would be the loser unless the government pressed ahead with the programme. He said that he realised there was a conflict between the cash restraints imposed on the electricity generating industry and the decision to build the stations, but their cost was "fully reflected" in last month's public expenditure White Paper.

His statement also confirmed that the government is moving towards a decision to build the American pressurised water reactors [PWR].

The government plans one nuclear power station a year until 1990 at a total cost of over 1,000 million a year, but the two AGRs may be the only ones of this type included. They are planned for Heysham, Lancashire, and Torness, Scotland, and will ensure work for 2,000 workers at the boiler-making branch of Northern Engineering Industries at Gateshead as well as others involved in the British nuclear industry.

It was on the grounds of the industrial damage which would be done to regional development areas that the Cabinet's think tank found in favour of the AGR.

Mrs Thatcher, who initiated the think tank investigation into the relative merits of the two types of reactor is known to prefer the PWR, despite American doubts on its safety.

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Friends of the Earth, the conservation organisation, described yesterday's announcement as an "absurd" decision.

"They (AGRs) have been a disaster story, and these new stations will be the fourth prototypes in AGR design to be built. The government is determined to pursue the nuclear power programme in spite of the cost, which has escalated from 1,500 million in 1978 to 2,400 million pounds today.

"That must be seen against forecasts that demand for electricity is falling through the 80's by more than the total initiated capacity."

In the Commons Mr Howell insisted that in spite of unwelcome delays, the prospect was that the new stations would produce electricity highly competitively and economically. He said Britain has the capacity to build AGRs now, while PWRs are an "objective." He stressed that "building nuclear" is essential in order that we may be a little less far behind our European competitors.

The AGRs were first chosen as part of Britain's nuclear programme by Mr Tony Benn when he was Labour's energy secretary. Yesterday, shadow energy secretary, Dr David Owen, welcomed the decision to go ahead.

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